

What is claimed is

1. A puller tool for pulling a mandrel through a split sleeve that is an opening in a workpiece, said puller tool comprising:

an elongated first tubular member having a mandrel receiving center passageway and a slotted outer end portion comprising first axial fingers separated  
5 by first axial slots;

an elongated second tubular member surrounding said first tubular member and having a slotted outer end portion comprising second axial fingers separated by second axial slots;

an elongated third tubular member surrounding said second tubular member  
10 and having a slotted outer end portion comprising third axial fingers separated by third axial slots;

an elongated mandrel inside said center passageway, said mandrel having a small diameter inner end portion, a large diameter outer end portion, and an increasing diameter portion extending from the small diameter inner end portion to  
15 the large diameter outer end portion;

said third fingers having outer end portions forming an end opening and including radially inwardly projecting clamp jaws having substantially radial first clamp surfaces;

said first axial fingers including outer end portions having substantially radial  
20 second clamp surfaces which confront the first clamp surfaces;

said first tubular member being extendable and retractable longitudinally of the second and third tubular members;

said first and second tubular members having first and second cam surfaces,

said first cam surfaces being radially outwardly directed on the first axial fingers and

25    said second cam surfaces being radially inwardly directed on the second axial  
fingers;

        said first and second cam surfaces being adapted to contact each other and  
expand the second axial fingers radially in response to the first tubular member

being retracted into the second tubular member, and said expansion of the second  
30    axial fingers being adapted to cause an expansion of the third axial fingers and an  
enlargement of the end opening formed by the axial fingers of the third tubular  
member;

        a tubular sleeve having an inner end and a flange projecting radially outwardly  
from said sleeve at said inner end, said flange being sized to move axially through

35    the end opening in the outer end of the third tubular member when the third axial  
fingers are expanded, and said flange being sized to be received between and be  
clamped by the first and second clamp surfaces when the first tubular member is  
extended axially and the second and third axial fingers are contracted radially;

        said tubular sleeve having a tubular portion that extends axially from the

40    flange and the end opening when the flange is clamped by and between the first and  
second clamp surfaces;

        said mandrel being extendable axially through the center passageway of the  
first tubular member and axially through the tubular sleeve when the radial flange is  
clamped by and between the first and second clamp surfaces; and

45           said mandrel being retractable through the sleeve and into the center  
passageway, when the radial flange is clamped by and between the first and second  
clamp surfaces.

2. The puller tool of claim 1, comprising a housing having a first end including an end opening, wherein the first tubular member has an inner end portion which extends through the end opening into the housing, and said second and third tubular members have inner ends which are connected to the first end of the housing.

3. The puller tool of claim 2, comprising a push/pull member within said housing to which the inner end of the first tubular member is connected.

4. The puller tool of claim 3, wherein the push/pull member is tubular and the elongated mandrel has an inner end portion that extends from the first tubular member into the push/pull member, and there is a second push/pull member in said housing to which the mandrel is connected.

5. The puller tool of claim 1, wherein said mandrel includes an endwise outwardly tapering portion extending endwise outwardly beyond said large diameter outer end portion.

6. The puller tool of claim 1, wherein the clamp jaws of the third fingers include axial surfaces extending axially from the substantially radial first clamp surfaces, and said outer end portions of said first axial fingers include axial surfaces that extend axially from the radial second clamp surfaces, wherein when the flange on the sleeve is clamped by and between the first and second clamp surfaces, the axial surfaces on the first axial fingers are contiguous the axial surfaces on the

clamp jaws.

7. The puller tool of claim 1, wherein the tubular sleeve has a single axial spit and is adapted to expand in diameter in response to the large diameter portion of the mandrel being moved axially through it.

8. The puller tool of claim 7, comprising a housing having a first end including an end opening, wherein the first tubular member has an inner end portion which extends through the end opening into the housing, and said second and third tubular members have inner ends which are connected to the first end of the

5 housing.

9. The puller tool of claim 8, comprising a push/pull member within said housing to which the inner end of the first tubular member is connected.

10. The puller tool of claim 9, wherein the push/pull member is tubular and the elongated mandrel has an inner end portion that extends from the first tubular member into the push/pull member, and there is a second push/pull member in said housing to which the mandrel is connected.

11. The puller tool of claim 7, wherein said mandrel includes an endwise outwardly tapering portion extending endwise outwardly beyond said large diameter outer end portion.

12. The puller tool of claim 7, wherein the clamp jaws of the third fingers include axial surfaces extending axially from the substantially radial first clamp surfaces, and said outer end portions of said first axial fingers include axial surfaces that extend axially from the radial second clamp surfaces, wherein when the flange on the sleeve is clamped by and between the first and second clamp surfaces, the axial surfaces on the first axial fingers are contiguous the axial surfaces on the clamp jaws.

13. For use with an inner tubular member that is divided by axial slots into axial fingers having substantially radial end surfaces, and an outer tubular member surrounding the inner tubular member and divided by axial slots into axial fingers having radial jaws positioned axially from the end surfaces on the fingers of the inner tubular member, said jaws having substantially radial surfaces that axially confront the end surfaces on the axial fingers of the first tubular member and cylindrical surface segments that extend axially from the substantially radial surfaces, a split sleeve, comprising:

a substantially cylindrical body portion having an axial edge at a first end and a substantially radial flange at an opposite second end that projects radially outwardly from the cylindrical body portion, and an axial split in both the substantially radial flange and the cylindrical body portion, wherein the flange has a substantially radial first surface that is contactable with the substantially radial end surfaces on the axial fingers of the first tubular member, and a substantially radial second surface that is contactable with the substantially radial surfaces on the jaws that are on the outer tubular member, and said substantially cylindrical body portion having a substantially cylindrical neck

portion extending axially from the flange into a position contiguous the substantially cylindrical segments on the substantially radial jaws of the outer tubular member when the substantially radial flange on the sleeve is positioned axially between the end  
20 surfaces on the axial fingers of the inner tubular member and the confronting, substantially radial surfaces on the jaws of the outer tubular member.

14. The split sleeve of claim 13, in which said sleeve has a center axis and said radial flange extends in a plane that is substantially perpendicular to the center axis.

15. The split sleeve of claim 14, in which the portion of the split that is in the substantially radial flange widens radially outwardly.